COMMONWEALTH OF VIRGINIA
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT
Richmond, Virginia

DIVISION OF GEOLOGY
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VIRGINIA MINERALS

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A quarterly designed to acquaint the public with the mineral resources and activities of Virginia, and to furnish information on market quotations, new discoveries and developments, and pertinent publications. Distributed free upon request to the Division of Geology.

Virginia's Oil and Gas Resources

W. T. Harnsberger

Oil and natural gas, two of our most valuable resources, are generally believed to result from the decomposition of marine life which has, after death, accumulated on the ocean floor. Muds and oozes, deposited at the same time as the organic debris, later harden into shales and limestones, providing source rocks of oil and natural gas. Many source rocks are too dense or tight to allow the oil and gas to migrate easily. In order for oil and gas to flow when tapped by drilling, they must have moved into a porous -- reservoir -- rock, a sandstone or fractured limestone. Natural gas and oil are lighter than water with which they are often associated, and tend to rise above the water in the reservoir. So that they cannot escape upward, an impervious rock overlying the reservoir rock is necessary. Ideally the reservoir and impervious rock strata should be uparched -- folded to form an anticline -- thus trapping the oil and gas. Therefore, prerequisites for oil and gas accumulation are: (1) a source bed; (2) porous rock to serve as a reservoir; (3) impervious overlying rock to prevent escape of the accumulated oil and gas; and (4) a trap (anticline).

Exploration for oil and gas in Virginia dates back to the 1890's when a test well was drilled to a depth of 2,153 feet on the farm of G. W. Gish, about two miles south of Ramsey in Wise County. A slight show of gas was encountered at a depth of 626 feet, but no indications of oil were found. Though other attempts were made to find oil and gas during the next thirty years, determined interest seemed to be aroused when Davis Elkins and Associates of West Virginia decided to test drill on the small Early Grove anticline in Scott County, southwestern Virginia. Dr. Charles Butts had previously reported in Bulletin 27 of the Virginia Geological Survey that this area looked as promising as any he had observed in that section of the state. On June 4, 1931, a test well was completed at a depth of 3,272 feet, with a reported initial volume of about 1,750,000 cubic feet of gas daily. The success of this well led to the drilling of eight additional wells and the development of the Early Grove gas field, Scott and Washington counties. Six wells were completed as producers, the initial open flows varying from 75,000 cu. ft. to 1,750,000 cu. ft. of gas daily. Studies of the gas sand revealed that the porosity was unusually low, thus indicating rapid declines in pressure and implying a relatively short life for the wells. The gas from the Early Grove field is piped about eight miles for use in Bristol, Virginia-Tennessee. Even though this discovery of gas was small, it encouraged further exploration in the western and particularly the southwestern part of the state.

Attempts to discover commercial quantities of oil have been made in Lee County for many years, at least since the drilling of a well in Possum Hollow in 1910. Surface seeps of oil had been known for several decades preceding the drilling of this first well. No significant production was obtained, however, until the spring of 1942, although several wells drilled earlier had small shows of oil. The B. C. Fugate #1 well, completed in May 1942 on Fourmile Creek a few miles south of Ewing, was the first commercially productive oil well in Virginia. It lies in what is now the Rose Hill oil field. This well, drilled to a depth of 1,115 ft., yielded the first commercial quantity of oil east of the Appalachian Plateaus. The initial daily production of sixty barrels soon declined to eight barrels. The B. C. Fugate #2 well, near the #1, was a dry hole, whereas the B. C. Fugate #3 well, drilled in 1943, initially yielded three to four barrels per day. No further production was obtained from the Rose Hill field until 1945.

The most intensive drilling for oil in the Rose Hill field, Lee County, was carried on during 1946, 1947, and 1948. At least 86 wells have been drilled in search of oil in Lee County through 1954, and 34 of these have produced some oil. The Rose Hill oil field was producing an estimated 600 barrels a day during the spring of 1947, but three years later the total daily production was only 100 barrels. In 1951, the first year that accurate figures were obtainable, production amounted to 11,007 barrels. In 1952, 9,824 barrels were produced and in 1953, 7,603 barrels. Preliminary estimates indicate about 6,500 barrels were produced in 1954.

Oil from the Rose Hill field is clear, amber-green, high volatile, paraffin base, with a gravity of 44.4° A. P. I. Recent information shows the oil is valued at $3.69 per barrel at the refinery, including a $0.75 per barrel subsidy. The oil is produced into storage tanks and is trucked from the Rose Hill field to Middlesboro, Ky. Then it is shipped by railroad to a refinery near Charleston, W. Va.

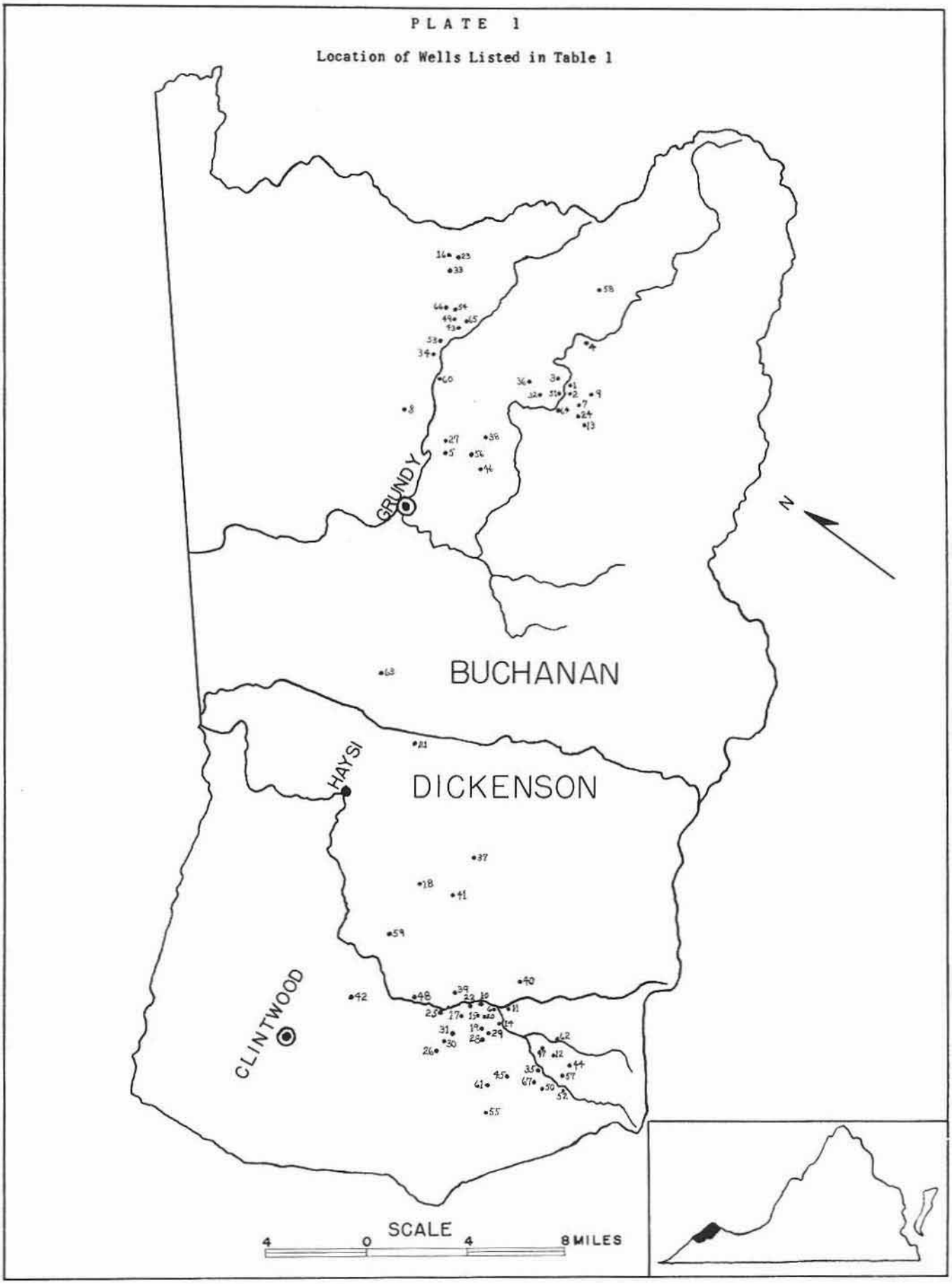
TABLE 1

Successful Gas Wells Completed in Buchanan and Dickenson Counties from 1948 to 1954

	Farm and Well	Operator	Location		Completed	Total Depth (feet)	Est. Yield (thou. cu. ft.)
			District	County			
1.	W. M. Ritter #1-V	United Prod. Co.	Garden	Buchanan	2-1-48	2301	17,196
2.	W. M. Ritter #3-V	do.	do.	do.	7-26-48	2986	4,213
3.	Slocum Land Corp. #1	do.	Grundy	do.	8-28-48	2365	337
4.	R. J. Carlson #1	Pipeline Drill.	Garden	do.	2-23-49	4731	343
5.	A. L. Powers #1	do.	Grundy	do.	4-10-49	3725	3,005
6.	H. P. Phillips #101	Clinchfield Coal	Ervington	Dickenson	4-12-49	4551	1,632
7.	Yukon Pocahontas #3	United Prod. Co.	Garden	Buchanan	5-7-49	4399	6,115
8.	F. H. Curtis #1-A	Pipeline Drill.	Grundy	do.	6-1-49	3461	6,005
9.	Yukon Pocahontas #4	United Prod. Co.	Garden	do.	9-26-49	2404	20,134
10.	J. C. Rasnick #103	Clinchfield Coal	Ervington	Dickenson	10-18-49	3910	666
11.	E. C. Smith #104	do.	do.	do.	10-20-49	4033	1,555
12.	A. Rose #105	do.	Clintwood	do.	12-22-49	5376	442
13.	Yukon Pocahontas #5	United Prod. Co.	Garden	Buchanan	1-11-50	4358	926
14.	G. W. C. Smith #106	Clinchfield Coal	Ervington	Dickenson	1-22-50	5754	539
15.	R. Counts #109	do.	do.	do.	5-22-50	4250	5,116
16.	W. M. Ritter #5-V	United Prod. Co.	Knox	Buchanan	7-27-50	3323	1,784
17.	E. T. Sutherland #114	Clinchfield Coal	Ervington	Dickenson	9-18-50	3987	4,160
18.	N. Counts #110	do.	Sand Lick	do.	9-22-50	5241	404
19.	E. Smith #116	do.	Ervington	do.	12-15-50	4247	1,774
20.	E. Smith #117	do.	do.	do.	2-10-51	4713	6,880
21.	T. K. Colley #113	do.	Sand Lick	do.	2-15-51	4578	223
22.	A. Rose #115	do.	Ervington	do.	2-20-51	5968	337
23.	W. M. Ritter #7-V	United Prod. Co.	Knox	Buchanan	4-23-51	3920	700
24.	Yukon Pocahontas #10	do.	Garden	do.	5-14-51	4504	6,590
25.	D. Anderson #120	Clinchfield Coal	Ervington	Dickenson	5-24-51	5545	290
26.	W. Rose #119	do.	do.	do.	6-6-51	5332	442
27.	W. H. Matney #1	United Prod. Co.	Grundy	Buchanan	6-12-51	4637	520
28.	B. Rose #122	Clinchfield Coal	Ervington	Dickenson	6-13-51	4776	1,205
29.	D. E. Smith #123	do.	do.	do.	9-17-51	4794	2,249
30.	N. Smith #121	do.	do.	do.	9-21-51	5627	315
31.	N. Smith #124	do.	do.	do.	9-21-51	4351	1,048
32.	Slocum Land Corp. #3	United Prod. Co.	Grundy	Buchanan	10-25-51	2300	22,263
33.	W. M. Ritter #8-V	do.	Knox	do.	3-24-52	4005	484
34.	J. McClanahan #1	Slate Creek Dev.	Grundy	do.	3-30-52	3661	3,130
35.	J. & V. M. Page #128	Clinchfield Coal	Ervington	Dickenson	6-20-52	4289	340
36.	Yukon Pocahontas #14	United Prod. Co.	Grundy	Buchanan	8-5-52	3910	838
37.	J. H. Sutherland #132	Clinchfield Coal	Sand Lick	Dickenson	8-15-52	5889	880
38.	Yukon Pocahontas #15	United Prod. Co.	Grundy	Buchanan	8-18-52	3858	2,130
39.	J. Pressley #130	Clinchfield Coal	Ervington	Dickenson	9-4-52	5914	1,122
40.	W. M. Phipps #131	do.	do.	do.	9-26-52	6264	492
41.	E. S. Counts #133	do.	Sand Lick	do.	11-18-52	5929	696
42.	F. A. Stratton #136	do.	Clintwood	do.	1-6-53	5527	959
43.	W. M. Ritter #10-V	United Prod. Co.	Grundy	Buchanan	2-12-53	3622	315
44.	B. Lee #139	Clinchfield Coal	Ervington	Dickenson	2-20-53	4501	11,000
45.	J. S. Rose #138	do.	do.	do.	4-2-53	6104	1,283
46.	Yukon Pocahontas #20	United Prod. Co.	Grundy	Buchanan	4-20-53	3865	1,400
47.	E. Hilton #141	Clinchfield Coal	Ervington	Dickenson	5-6-53	3269	1,000
48.	P. Reedy #135	do.	do.	do.	5-15-53	5516	1,008
49.	W. M. Ritter #11-V	United Prod. Co.	Grundy	Buchanan	6-16-53	2285	1,494
50.	S. S. Rose #142	Clinchfield Coal	Ervington	Dickenson	7-24-53	5075	1,600
51.	Slocum Land Corp. #5	United Prod. Co.	Grundy	Buchanan	8-7-53	2147	11,444
52.	C. Kiser #140	Clinchfield Coal	Ervington	Dickenson	9-10-53	6962	1,143
53.	C. L. Ritter #2	United Prod. Co.	Grundy	Buchanan	10-15-53	3472	379
54.	W. M. Ritter #12-V	do.	do.	do.	11-23-53	2732	268
55.	F. E. McCoy #145	Clinchfield Coal	Ervington	Dickenson	12-31-53	6436	1,055
56.	W. H. Matney #3	United Prod. Co.	Grundy	Buchanan	1-11-54	3931	1,980
57.	Standard Banner #153	Clinchfield Coal	Ervington	Dickenson	2-21-54	5014	8,175
58.	L. B. Rogers #1	United Prod. Co.	Garden	Buchanan	3-9-54	4704	239
59.	Ayers & Ashton #157	Clinchfield Coal	Ervington	Dickenson	4-10-54	5685	1,240
60.	S. B. Avis #2	United Prod. Co.	Grundy	Buchanan	4-21-54	3513	1,138
61.	P. R. Smith #147	Clinchfield Coal	Ervington	Dickenson	4-30-54	6122	696
62.	Standard Banner #152	do.	do.	do.	4-30-54	6133	984
63.	W. Deel #154	do.	Grundy	Buchanan	6-1-54	5796	1,283
64.	Yukon Pocahontas #22	United Prod. Co.	Garden	do.	6-14-54	3858	355
65.	W. M. Ritter #14-V	do.	Grundy	do.	7-9-54	2476	146
66.	W. M. Ritter #13-V	do.	do.	do.	7-13-54	4064	298
67.	C. C. Rose #164	Clinchfield Coal	Ervington	Dickenson	9-8-54	3286	696

PLATE 1

Location of Wells Listed in Table 1



In nearly all the producing wells the oil has come from the Trenton limestone of Ordovician age. At least three different horizons within the Trenton may be oil-bearing. These horizons are not all present in each producing well, and their position within the Trenton may vary from well to well. Available evidence indicates that the oil is in small fractures in the Trenton limestone rather than in pore spaces.

Natural gas has been known in the Appalachian coal fields in southwestern Virginia for many years. Tests seeking natural gas in commercial quantities have been drilled in Buchanan, Dickenson, Russell, Tazewell, and Wise counties. Many of the older wells exhibited good shows of gas at various depths in different rock strata. Although some of these discoveries were encouraging, quantities of gas encountered were small and impetus seemed to be lacking for large capital investments in any specific locality. Difficulty in obtaining tubing, casing, and other necessary supplies hampered drilling operations during World War II. By 1947, vigorous explorations were again renewed by several natural gas companies, independent operators, and one large coal company. Several gas wells completed in 1948 yielded the largest quantities of natural gas discovered in Virginia to date. Most of the drilling activity was in Buchanan and Dickenson counties, where five wells were completed during the year. The first large gas well, W. M. Ritter Lumber Company No. 1-V, with an initial open flow of 17,196,000 cu. ft., was completed on February 1, 1948, by the United Producing Company, Inc., of Charleston, W. Va. This well is located in the Garden District of Buchanan County about two miles southwest of Dwight.

Table 1 lists most of the successful gas wells drilled in Buchanan and Dickenson counties for which records are available through 1954. The index map shows the approximate location of the wells. Drilling activity has been concentrated in these two counties, although exploration has been rather extensive throughout much of the western part of the state. Recent information indicates that approximately 150 wells have been drilled in Buchanan and Dickenson counties during the past seven years. All the completed wells (those with good shows of gas and believed capable of production) were capped awaiting the construction of a pipe line. In November 1952, deliveries of gas began from wells in Buchanan County into the recently laid lines of Hope Natural Gas Company. Figures furnished by Wilbur H. Seifert, State Oil and Gas Inspector, show a total production for the entire state of 1,216,683 MCF (thousands of cubic feet) of gas in 1952 and 3,932,229 MCF in 1953. Production data for 1954 are not now available. Wells in Buchanan County alone produced 1,135,545 MCF of gas in 1952 and 3,855,502 MCF in 1953.

Gas was discovered in the northwest part of Rockingham County in June 1941, when a show of approximately 60,000 cu. ft. was obtained in a well, 2,992 feet deep, on the Souder farm near Bergton. After several attempts by various groups to discover commercial quantities of gas in this section had ended in failure, the United Fuel Gas Company of Charleston, W. Va., deepened the old Souder well less than ten feet in the fall of 1951 and obtained an initial open flow of 1,043,000 cu. ft. of gas. Two other wells were completed with good shows of gas the following year. All these wells are located on the Crab Run-Bergton anticline and are drilled to the Oriskany sandstone, the producing horizon. Depths of the wells range from 2,996 to 3,768 feet.

Western Virginia has received nearly all the attention devoted to oil and gas exploration in the state. The requisites for oil and gas accumulation as outlined in the opening paragraph are found locally west of the Blue Ridge only, and it is highly improbable that anyone would care to risk large amounts of capital in other parts of the state where the possibilities are not considered favorable. The outlook for increased production of oil is not encouraging at the present time, but additional exploration is warranted. The future for increased production of natural gas in Virginia, however, looks very bright judging from past and recent discoveries.

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NEW PUBLICATIONS

Several publications and articles contributing to knowledge of the geology of Virginia have appeared since the last number of VIRGINIA MINERALS was issued. J. O. Jones and N. A. Eilertsen, in Report of Investigations No. 5075 of the U. S. Bureau of Mines, discuss the Willis Mountain kyanite deposit in Buckingham County. Their report includes numerous diamond-drill core and sludge analyses. The Publications Distribution Section, U. S. Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pa., will send single copies free upon request.

"Silica Sand Resources of Western Virginia," by W. D. Lowry, Associate Professor of Geology at Virginia Polytechnic Institute, was published in October as Virginia Engineering Experiment Station Series No. 96. This paper describes individual sand deposits in considerable detail. It may be purchased from the Virginia Engineering Experiment Station at Blacksburg for 75 cents.

United States Geological Survey Bulletin 990, "Geology and Oil Resources of the Jonesville District, Lee County, Virginia," by Ralph L. Miller and William P. Brosge, was received at the division office in December. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for $2.75, this bulletin contains the results of field work done under a cooperative agreement between the U. S. Geological Survey and the Virginia Division of Geology.

An article on the lithium processing plant at Sunbright, Scott County, appeared in the September issue of Pit and Quarry magazine. This plant is the world's largest for the production of lithium chemicals, used in ceramics, glass, air conditioning, systems, and numerous other purposes.

The University of Virginia Newsletter for November 15 was written by William M. McGill, State Geologist, on the topic "Virginia's Mineral Industries." A copy may be obtained on request to the Division of Geology.

Much information about Virginia's production of fuels is contained in Volume II, "Fuels," of the Minerals Yearbook 1952. This book on fuels production in the U. S. is for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for $2.25.

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NEW MAP

The topographic map of the Radford 15-minute quadrangle, which was completed in 1950, has been declassified and released for general distribution. This map covers the area from 37°-37°15' N., 80°30'-80°45' W., on a scale of 1:62,500 and with a contour interval of 20 feet. It may be purchased for 20 cents, through either the Virginia Division of Geology, Charlottesville, or the U. S. Geological Survey, Washington 25, D. C.

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VALUE OF MINERAL PRODUCTION DROPS

A preliminary estimate of the value of Virginia's mineral production in 1954 is $148,317,000. This compares with a recently revised preliminary value of $162,397,000 for 1953 and a final total of $164,625,000 for 1952. The drop in production value in 1954 is largely due to a decrease in value of coal produced.

"IRON IN VIRGINIA"

Mineral Resources Circular No. 1, the first in a new series of publications of the Division of Geology, will be ready for distribution in late January. This circular, "Iron in Virginia," after presenting some general information about iron, discusses Virginia's past, present, and potential future role as an iron producer.

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URANIUM

The present intense interest in uranium leads to much excitement when a discovery of uranium is reported. Frequently such reports prove to be unwarranted. It should be stressed, for those who are using or contemplate using a Geiger counter (the best way to prospect for uranium minerals) that the mere detection of radioactivity does not prove the presence of uranium. A Geiger counter will record a small number of beats simply because of cosmic rays and the negligible amounts of radioactive material present in almost every substance. Moreover, not all notably radioactive minerals contain uranium. Thorium is the highly radioactive element most common in Virginia.

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ARTICLE BY STAFF MEMBER

An article by Robert S. Young, Virginia Division of Geology, was published in the September issue of The Bulletin of the American Association of Petroleum Geologists, a leading national geologic journal. Dr. Young's paper is entitled "Preliminary X-Ray Investigation of Solid Hydrocarbons."

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GIFT TO DEPARTMENT OF GEOLOGY

The Department of Geology of the University of Virginia has received a gift of $2500 from Mrs. Virginia Cross of Philadelphia. This money is to be applied toward special needs of the department. Mrs. Cross is the widow of Whitman Cross, a well-known geologist.

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PARK SITE INVESTIGATION

The State Geologist and the ground-water geologist of the division visited in November the Breaks of the Sandy area in Dickenson County, Va., and adjoining parts of Pike County, Ky. A preliminary investigation of local ground-water possibilities was conducted, and suggestions were made regarding the drilling of test wells in an effort to develop water for the needs of the proposed BiState park to be developed in this area.

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MINING LEASE

Mr. Sidney S. Alderman, after conducting preliminary explorations under a prospecting lease granted by the Commonwealth of Virginia, has requested a mining lease on two areas in Chesapeake Bay. One of these areas is near Fort Monroe and the other is near Cape Charles.

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SELECTED DIVISION PUBLICATIONS

The following is a partial list of available division publications. Unless a price is shown the item is free upon application. Checks and money orders should be made payable to the Division of Geology.

Bulletins

32 - Sand and gravel resources of the Coastal Plain province of Virginia, by C. K. Wentworth, 1930.

34 - Geology and mineral resources of the Roanoke area, Virginia, by H. P. Woodward, 1932. Price: 50 cents.

38 - Kyanite in Virginia, including Geology of the kyanite belt, by A. I. Jonas, and Economic aspects of kyanite, by J. H. Watkins, 1932. Price: $1.00.

41 - Preliminary report on ground-water in northern Virginia, by R. C. Cady, 1933.

43 - Zinc and lead region of southwestern Virginia, by L. W. Currier, 1935. Price: 50 cents.

44 - Preliminary report on gold deposits of the Virginia Piedmont, by C. F. Park, Jr., 1936. Price: 50 cents.

45 - Ground-water resources of the Shenandoah Valley, Virginia, by R. C. Cady, with analyses by E. W. Lohr, 1936.

46 - Contributions to Virginia geology, 1936. Contains 13 papers of which the following are available as separates:
- A. Origin of our scenery, by Arthur Bevan.
- C. William Barton Rogers and his contribution to the geology of Virginia, by J. K. Roberts.
- D. Origin of the Oriskany iron and manganese ores, by R. J. Holden.
- E. Humidity and waters of a limestone cavern near Lexington, Virginia, by Edward Steidtmann.
- F. An ebb and flow spring near Fairfield, Virginia, by M. H. Stow.
- G. The Natural Bridge of Virginia, by F. J. Wright.
- H. The origin of Mountain Lake, Virginia, by H. S. Sharp.
- I. Stratigraphy of Ordovician bentonite beds in southwestern Virginia, by R. S. Rosenkrans.
- K. Virginia's mineral contribution to the Confederacy, by R. S. Boyle.
- L. Stratigraphy and structure of the Marion area, Virginia, by B. N. Cooper. Contains a geologic map on a scale of one inch equals about 1 mile.
- M. The Big A Mountain area, Virginia, by R. A. Bates. Contains a geologic map of an area in northern Russell County, on a scale of one inch equals about 1½ miles.

47 - Outline of the mineral resources of Virginia, by William M. McGill, 1936. Price: 50 cents.

48 - Outline of the geology and mineral resources of Goochland County, Virginia, by C. B. Brown, 1937.

49 - Outline of the geology and mineral resources of Russell County, Virginia, by H. P. Woodward, 1938.

50 - Ground-water resources of northern Virginia, by R. C. Cady, 1938.

51 - Contributions to Virginia geology-II, 1939. Contains 8 papers of which the following are available as separates:
- C. Ridge-making thin sandstone in Frederick County, Virginia, by R. S. Edmundson.
- D. Varved slates in Fauquier County, Virginia, by L. R. Thiesmeyer.
- G. Origin of the narrow Cambrian belts north of Draper Mountain, Virginia, by B. N. Cooper.
- H. Geology of Little North Mountain in northern Virginia, by Charles Butts and R. S. Edmundson. Contains a geologic map (in colors) on a scale of one inch equals about three-quarters of a mile.

Maps

Topographic map of Buchanan County, Virginia, 1918. Scale, 1:62,500, or 1 inch equals about 1 mile; size, 35 x 43 inches. (From Bulletin 18) Price: 25 cents.

Geologic map of Buchanan County, Virginia, 1918. Scale, 1:62,500, or 1 inch equals about 1 mile; size, 35 x 43 inches. (From Bulletin 18) Price: 25 cents.

Topographic map of Dickenson County, Virginia, 1921, Scale, 1:62,500, or 1 inch equals about 1 mile; size 28 x 29 inches. (From Bulletin 21) Price: 25 cents.

Geologic map of Dickenson County, Virginia, 1921. Scale, 1:62,500, or 1 inch equals about 1 mile; size 28 x 29 inches. (From Bulletin 21) Price: 25 cents.

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Response to the first number of VIRGINIA MINERALS has been very satisfying. About one hundred requests to be placed on the mailing list have been received from individuals and groups, bringing the circulation to nearly 1000. The lead article, "A Summary of Virginia's Mineral Resources," was reprinted in abridged form in the December issue of Virginia Wildlife.

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Virginia Minerals Vol. 1, No. 2 January, 1955
Edited by C. C. Fisher